Extrusion Molding Technique Basic Course
(Introduction Course)

押出成形技術基礎講座（入門コース）

THE JAPAN SOCIETY OF PLASTICS TECHNOLOGY

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ついてはすでに説明したが、使用する樹脂によっていかなる数値を決めるか、理論的な数値計算は当然であるが、むしろ多くの実験値や経験から基本的な数値が決められてきたようにも考えられる。

これらの多くの実験値や経験値を説明するだけの紙面はないので、最も広く使用されている65mm押出機を例として、パイプ、チューブ、シート、フィルム、異形などの押出成形機における各種樹脂の最も適切と考えられるスクリュー構造を表Ⅰ－1に示した。図Ⅰ－20の一軸スクリューの基本図と照し合わせて各部の数値の違いをみて頂きたい。

Table I-1 (Selection of Screw by Resin (65mmφ extruder)

表1－1　樹脂別スクリューの選定(65mmφ押出機)

樹脂の種類	有効長 (L/D)	圧縮比 (C/R) (体積比) Compression Ratio	フィード部のピッチ数 (山)	フィード部の深さ (h1)	メタリング部のピッチ数 (山)	メタリング部の深さ (h2)	スクリューのタイプ
軟質PVC (pellet)	24～28	2.8～3.0	7～10	10	5～7	3	メタリングタイプ
軟質PVC (powder)	26～28	3.0～3.2	7～10	10	5～7	2.8	〃
軟質PVC (高重合)	26～28	3.5～3.7	7～10	9	6～8	2.2	〃
硬質PVC (pellet)不透明	24～28	2.5～2.7	7～10	9	5～6	3.1	〃
硬質PVC (powder)不透明	26～28	2.8～2.8	6～10	9	5～6	3	〃
LDPE	26～28	3.4～3.6	7～9	11	5～8	2.7	〃
HDPE PP	26～28	3.5～3.7	7～9	11.5	5～8	2.7	〃
polyamid (ナイロン)	24～28	3.2～3.4	10～12	11.5	7～9	3	油圧調タイプ
PMMA (アクリル)	24～28	2.3～2.5	6～8	9.2	5～6	3.4	メタリングタイプ
acetal (デルリン)	24～28	3.2～3.4	6～8	11.5	5～7	3	〃
フッ素 (テフロン100)	24～26	2.6～2.8	10～12	9	6～7	3	急圧縮タイプ
ABS	24～28	2.5～2.7	7～9	9	5～6	3.1	メタリングタイプ
EVA	24～28	2.6～2.8	7～8	9	5～6	3	〃
PC (ポリカーボネート)	24～26	2.5～2.7	6～9	8.5	5～6	3	〃
ウレタン (エラストマー)	20～28	2.9～3.1	6～7	10.3	8～11	3	長メタリングタイプ
繊維素系樹脂 (アセチロイド)	24～26	2.3～2.5	12～14	8.6	6～7	3.2	急圧縮タイプ
低発泡PS (合成木材)	24～28	2.9～3.1	7～8	9.4	5～6	2.8	メタリングタイプ
ポリエステル (エラストマー)	26～28	3.3～3.5	7～8	9.7	7～10	2.5	〃
変性PPO (ノリル)	26～28	2.9～3.1	7～8	9.5	11～12	2.8	急圧縮タイプ

Polyester

・PVC　：塩化ビニル
・LDPE　：低密度ポリエチレン
・HDPE　：高密度ポリエチレン
・PP　：ポリプロピレン
・EVA　：エチレン酢酸ビニル共重合体
・PS　：ポリスチレン

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In application of:
ITOH et al.:
Serial No. 10/501,092:
Filed on January 25, 2005:
For: POLYESTER FILMS:

Examiner: Alicia M. Toscano
Group Art Unit: 1712

DECLARATION UNDER 37 CFR 1,132

Honorable Commissioner of
Patents and Trademarks,
Washington, D.C. 20231

Sir:

I, Hideki SHIMIZU, declare:

That I am a citizen of Japan, whose full post office address is c/o Toyo Boseki Kabushiki Kaisha, Tokyo Branch Office, Packaging Development Division, Toyobo Building 17-9, Nihonbashi, Koami-cho, Chuo-ku, Tokyo 103-8530, Japan;

That my education and employment history is as follows:

I was graduated from Graduate School, Shizuoka University in March 1988 and awarded a Master's Degree of Engineering (Chemical Engineering);

In April 1988, I was employed by Toyo Boseki Kabushiki Kaisha, and since then, I have been engaged in the development of biaxially-stretched polyester films at Film Development Division in Inuyama Plant;

In 1993, I started working on the development of films for laminating metal plates; I now work in the Packaging Development Division, Tokyo Branch Office, and am engaged in general development of new films including films for laminating metal plates;

That I have fully understood the subject matter of the above-identified U.S. patent application No. 10/501,092 and the subject matter of the cited reference, Majima et al. (WO 01/092,417, U.S.6,780,482);

That I conducted the following experiment to establish that the polyester film of the present invention is not the same as the one disclosed in Majima et al.;

That the following demonstrates such fact:

Experiment

1. Purpose of the experiment

To prove that the polyester film of example 11 of Majima et al. is not encompassed within the subject matter of claim 1 of the present application (US No. 10/501,092)

2. Reasons for selecting example 11 of Majima et al.

Example 12 of the present application is directed to a film that is produced using a single extruder and is encompassed within original (before amendment) claim 1. In particular, the film is obtained by feeding polyethylene terephthalate (PET), polybutylene terephthalate (PBT) and a phosphorus compound into an extruder in a proportion of 40/59.97/0.03 (parts by weight) followed by extrusion and drawing. The resulting film had a half value width of recrystallization peak (1/h) of 0.25 and satisfied the requirement (half value width of recrystallization peak (1/h) of not more than 0.25) of original (before amendment) claim 1.

On the other hand, the film of example 11 of Majima et al. is obtained by feeding PET (Tm=255°C) and PBT (Tm=223°C) in a proportion of 40/60 (wt.%) followed by melt-mixing and extrusion by a single extruder and then drawing. This film is similar to the film of example 12 of the present application in polyester composition and use of a single extruder in the film production, and has an Ester Exchange Index of 3% and thus is considered to be a film of the most superior characteristics among the films of the examples of Majima et al. These are the reasons for the selection.

3. Film production

1) A film was produced according to example 11 of Majima et al. In particular, pellets were fed such that PET (limiting viscosity: 0.72, carboxyl group: 20 equivalent/t, Tm=254°C) and PBT (limiting viscosity: 1.1, carboxyl group: 10 equivalent/t, Tm=222°C) were fed in a proportion of 40/60 (wt.%) in conjunction with 0.1 wt.% of silica having an average particle diameter of 1.4 μm, and melt-mixed by an extruder. Since Majima et al. does not specify the type of extruder, a screw-type extruder with a 65 mmφ single screw, L/D=25 and a compression ratio of 3.5 that is usually used in a PET film-forming test was used. The temperature of the melt line was set at 270°C;

extrusion was performed such that the amount of extrusion was controlled to attain the detention time of 5 min; an unstretched sheet solidified by rapid cooling at the cooling temperature of 18°C was subjected to biaxial drawing under the conditions described therein; and heat treatment was then performed, thereby giving a biaxially drawn film with a thickness of 25 μm.

2) Property measurement

The half value width of recrystallization peak of the film was calculated according to the description of the present specification. The "DSC3100S" found in the specification is an equipment manufactured by Mac Science Co., LTD (currently distributed by Bruker AXS K.K. due to the assignment of business) is in fact an equipment manufactured by Mac Science. "Rigaku Corporation" in the specification is incorrect and should be "Mac Science Co., LTD".

Using DSC3100S, about 5 mg of the polyester film was weighted; the temperature was raised under a nitrogen gas atmosphere from room temperature to 280°C at a rise rate of 20°C/min; the film was maintained as it was for 1 min and cooled to room temperature at a rate of 20°C/min; and using the height (h) measured from the base line to the peak top of the crystallization peak, the half value width (l/h) was calculated by dividing temperature width l (mm) at a height of 0.5h by height h (mm).

4. Result of measurement

In reference to the DSC chart (attached herewith) of the measurement, the half value width of recrystallization peak was obtained according to the manner described above. The half value width (l/h) was 0.50.

Discussion

We performed a follow-up test with respect to example 11 of Majima et al., and a film was formed. However, this film did not satisfy the requirement of claim 1 of the present application ("half value width of recrystallization peak (l/h) of not more than 0.22"), and it was confirmed that this film is not encompassed within the present invention.

That I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

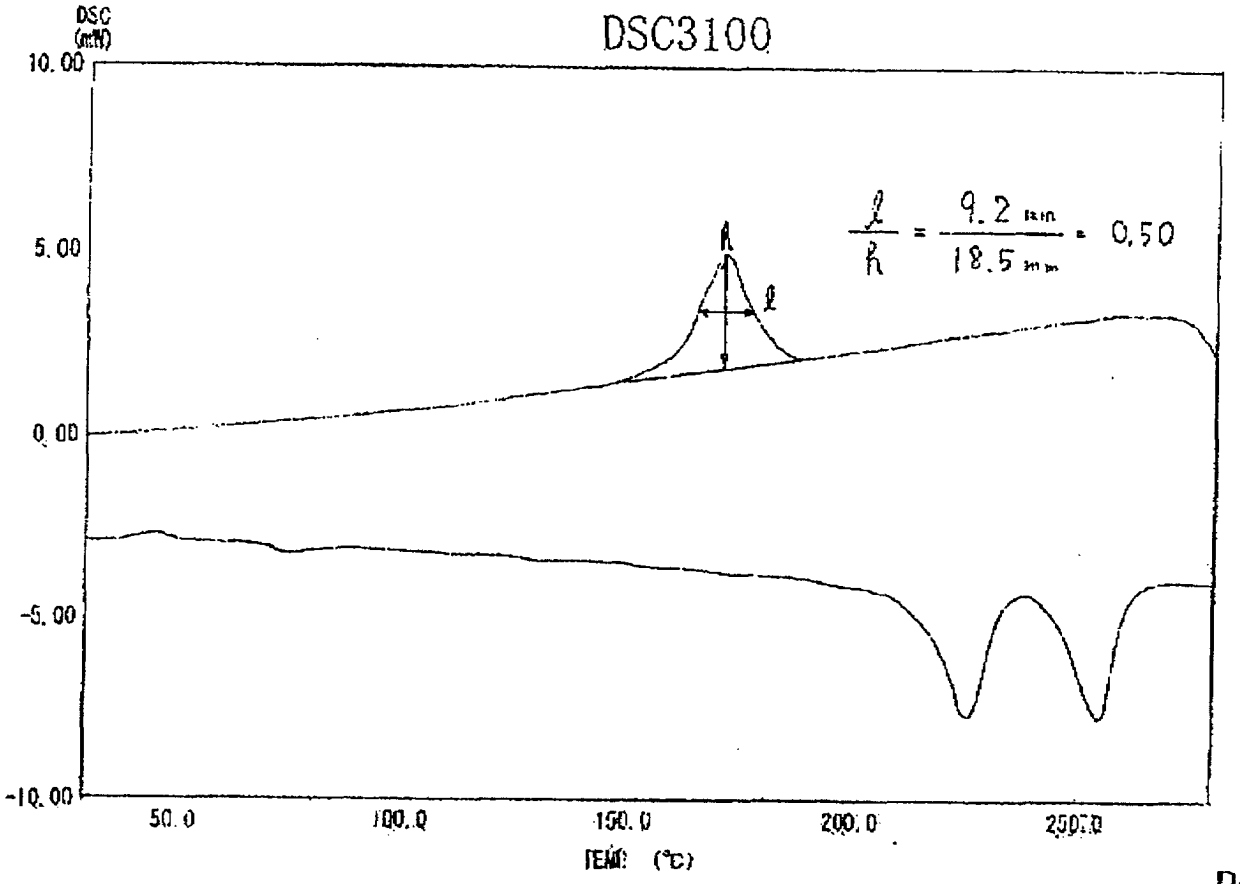
Signed at Shiga, Japan, this 10th day of December, 2007

Hideki Shimizu

Hideki SHIMIZU

Measured by: shimizu
Sample name: 020305-25

Date and time of measurement: 2007-12-05 13:35
Sampling: 1.0 sec
Sample weight: 5.57 mg
Temperature rise rate: 20.0 deg/min



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